CLAIMS

1. A cooling system, comprising:

an evaporator;

a suction line for refrigerant output from said evaporator;

a two stage compressor adapted to compress said refrigerant from said suction line, said compressor having

a first stage receiving said gaseous refrigerant from said suction line and outputting compressed gaseous refrigerant to an inter-cooler, and

a second stage receiving said gaseous refrigerant from said inter-cooler and outputting compressed gaseous refrigerant;

a gas cooler integrated with said inter-cooler, said gas cooler adapted to cool compressed refrigerant discharged from said compressor second stage;

a capillary tube adapted to carry cooled refrigerant from said gas cooler to said evaporator;

wherein said suction line and said capillary tube are disposed adjacent each other for heat exchange therebetween.

2. The cooling system of claim 1, wherein said capillary tube wraps around said suction line.

3. The cooling system of claim 1, wherein said refrigerant comprises carbon dioxide.

4. The cooling system of claim 1, wherein said cooling system is transcritical.

5. A cooling system, comprising:

an evaporator having an air side on which water condensation occurs;

a pan adapted to collect water condensate from the air side of said evaporator;

a suction line for refrigerant output from said evaporator;

a compressor receiving said refrigerant from said suction line and adapted to compress said refrigerant;

a gas cooler adapted to cool compressed refrigerant discharged from said compressor;

a refrigerant tube adapted to carry cooled refrigerant from said gas cooler through said pan in heat exchange relation with said collected water condensate;

a capillary tube adapted to carry cooled refrigerant from said refrigerant tube to said evaporator;

wherein said suction line and said capillary tube are disposed adjacent each other for heat exchange therebetween.

6. The cooling system of claim 5, wherein said refrigerant comprises carbon dioxide.

7. The cooling system of claim 5, wherein said cooling system is transcritical.

8. A cooling system, comprising:

an evaporator;

a suction line for refrigerant output from said evaporator;

a compressor receiving said refrigerant from said suction line and adapted to compress said refrigerant;

a gas cooler adapted to cool compressed refrigerant discharged from said compressor;

a capillary tube adapted to carry cooled refrigerant from said gas cooler to said evaporator;

a sensor adapted to sense one of external air temperature, suction line temperature, or suction line pressure; and

a controller adapted to selectively turn said compressor on and off based on the one temperature or pressure sensed by said sensor;

wherein said suction line and said capillary tube are disposed adjacent each other for heat exchange therebetween.

9. The cooling system of claim 8, wherein said controller turns said compressor on to compress said gaseous refrigerant only when said sensor senses external air temperature above a selected level.

10. A cooling system, comprising:

an evaporator;

a suction line for refrigerant output from said evaporator, said suction line including first and second substantially parallel straight cylindrical portions connected in series whereby said second straight cylindrical portion receives refrigerant from said first straight cylindrical portion;

a compressor receiving said refrigerant from said suction line and adapted to compress said refrigerant;

a gas cooler adapted to cool compressed refrigerant discharged from said compressor; and

a capillary tube adapted to carry cooled refrigerant to said evaporator, said capillary tube including first and second helically wound portions connected in series whereby said second helically wound portion receives cooled refrigerant from said first helically wound portion, said first helically wound portion being wrapped around said suction line second straight cylindrical portion and said second helically wound portion being wrapped around said suction line first straight cylindrical portion.

11. The cooling system of claim 10, further comprising a bypass safety valve between an inlet to said first helically wound portion of said capillary tube and an outlet from said second helically wound portion of said capillary tube, said bypass safety valve opening responsive to a pressure differential between said inlet to said first helically wound portion of said capillary tube and said outlet from said second helically wound portion of said capillary tube.

12. The cooling system of claim 10, wherein said suction line includes a U-shaped portion connecting said first and second cylindrical portions of said suction line.

13. The cooling system of claim 10, further comprising an accumulator between said first and second cylindrical portions of said suction line.

14. The cooling system of claim 10, wherein said refrigerant is CO_2 and said capillary tube is an expansion device for said cooled CO_2 refrigerant.

15. A cooling system, comprising:

an evaporator;

a suction line for refrigerant output from said evaporator, said suction line including

a straight portion substantially cylindrical about an axis, and

an accumulator between said evaporator and said suction line straight portion, said accumulator including

a phase separation chamber having an input for refrigerant from said evaporator and an outlet for gaseous refrigerant from which oil and liquid droplets have been separated in said phase separation chamber,

an accumulator including a discharge opening for discharging oil to return said oil to said system,

a vertical pipe between said phase separation chamber and said accumulator;

a compressor receiving said gaseous refrigerant from said suction line and adapted to compress said gaseous refrigerant;

a gas cooler adapted to cool compressed refrigerant discharged from said compressor; and

a capillary tube adapted to carry cooled refrigerant to said evaporator, said capillary tube including a portion helically wound around a central axis generally coinciding with said suction line straight portion axis;

wherein said suction line and said capillary tube are disposed adjacent each other for heat exchange therebetween.

16. The cooling system of claim 15, further comprising a second vertical pipe between said phase separation chamber and said accumulator, said second vertical pipe adapted to hold a selected volume of refrigerant charge.

17. A cooling system, comprising:

an evaporator;

a suction line for refrigerant output from said evaporator;

a compressor receiving said refrigerant from said suction line and adapted to compress said refrigerant;

a gas cooler adapted to cool compressed refrigerant discharged from said compressor;

a capillary tube adapted to carry cooled refrigerant from said gas cooler to said evaporator; and

a bypass tube around said capillary tube, said bypass tube including an inter-bleeding valve adapted to open responsive to a pressure differential above a selected level in said refrigerant discharged from said gas cooler;

wherein said suction line and said capillary tube are disposed adjacent each other for heat exchange therebetween.

18. The cooling system of claim 17, wherein said selected level is above normal operating pressures.

19. The cooling system of claim 17, wherein said refrigerant is carbon dioxide.

20. A cooling system, comprising:

an evaporator having an air side on which water condensation occurs;

a pan adapted to collect water condensate from the air side of said evaporator;

a suction line for refrigerant output from said evaporator;

a two stage compressor adapted to compress said refrigerant, said compressor having

a first stage receiving said refrigerant from said suction line and outputting compressed refrigerant to an inter-cooler, and

a second stage receiving said refrigerant from said inter-cooler and outputting compressed refrigerant;

a gas cooler integrated with said inter-cooler, said gas cooler adapted to cool compressed refrigerant discharged from said compressor second stage;

a refrigerant tube adapted to carry cooled refrigerant from said gas cooler through said pan;

a capillary tube adapted to carry cooled refrigerant from said gas cooler to said evaporator;

a bypass tube around said capillary tube, said bypass tube including an inter-bleeding valve adapted to open responsive to a pressure differential above a selected level in refrigerant discharged from said refrigerant tube;

a sensor adapted to sense one of air temperature, suction line temperature, or suction line pressure; and

a controller adapted to selectively turn said compressor on and off based on the a temperature or pressure sensed by said sensor;

wherein said suction line and said capillary tube are disposed adjacent each other for heat exchange therebetween.

21. The cooling system of claim 20, wherein said capillary tube wraps around said suction line.

22. The cooling system of claim 20, wherein said refrigerant comprises carbon dioxide.

23. The cooling system of claim 20, wherein said cooling system is transcritical.